Beamline 15-ID / ChemMatCARS-CAT

Scientific focus: Dynamic and structural condensed matter chemistry

Scientific programs: Time-dependent chemical crystallography scattering, anomalous scattering, micro crystallography; static and time-dependent surface scattering, dynamic protein diffraction, and small beam probing of complex structural polymers; interfacial and bulk studies using small- and wide-angle x-ray scattering; and coherent x-ray scattering of polymer/metal nanocomposites, nano-colloidal, and opaque materials.

Optics & Optical Performance

- Kohzu Seiki monochromator HLD-3
  - 3.1–22.5 keV energy range (for Si(111) and 25-mm offset)
  - 5°–40° angular range
  - 25–35 mm offset
  - cryo-cooled Si or water-cooled diamond modes
- Oxford/SESO vertically focusing mirror (A)
  - water cooling
  - white beam compatible
- Oxford/SESO water-cooled 2nd steering mirror (B)
- modes of operation:
  - 1) monochromator w/ or w/out mirror(s)
  - 2) white beam mirror operation
- high-energy-resolution monochromator
  - $\Delta E/E \sim 10^{-5}$
  - used with Kohzu monochromator
- in-station optics
  - steering crystal or multilayer for surface science
  - microfocusing optics

Experiment Stations

15-ID-A

- white beam first optics enclosure

15-ID-B

- white beam station
- crystallography

15-ID-C

- pink beam station
- surface science

15-ID-D

- SAXS/WAXS
- 10 m L x 5.8 m H

Detectors

- Amptek energy dispersive detector
- Canberra Ge detector
- Fuji imaging plates
- Bruker model 6000 CCD
- Princeton Scientific model LN/CCD-1024SF CCD
- NaI detectors
- Oxford ionization chambers
- avalanche photodiodes
- Bruker 4-quadrant CCD

Beamline Controls and Data Acquisition

- EPICS and SPEC in addition to IDL, Windows NT and Sun Workstations running channel access with tools such as MEDM
- electronics VM- and NIM-based

Beamline Support Equipment/Facilities

- Bruker kappa single-crystal diffractometer
- Huber 6-circle (15-ID-B & -C)
- liquid surface spectrometer (15-ID-C)
- monochromatic beam chopper for time-resolved studies
  - open time ~2.4 μsec
  - frequency ~ 1.3 kHz
  - attenuation ~2×10^{-7} at 33 keV
- Nd:YAG laser (λ = 355 nm, 400 μJ at 1000 Hz)

Insertion Device Source Characteristics (nominal)

source	Undulator A
period	3.30 cm
length	2.47 m
effective K_{max} (at minimum gap = 10.5 mm)	2.78
energy range 1st harmonic	2.9 - 13.0 keV
energy range 1st - 5th harmonics	2.9 - 45.0 keV
on-axis peak brilliance at 6.5 keV	9.6×10^{18} ph/sec/mrad²/mm²/0.1% bw
source size at 8.0 keV Σ_x Σ_y	 359 μm 21 μm
source divergence at 8.0 keV $\Sigma_{x'}$ $\Sigma_{y'}$	 24 μrad 6.9 μrad